INSTITUTIONAL PROGRAM REVIEW 2015 – 2016
Program Efficacy Phase: Instruction
DUE: March 30, 2016

Purpose of Institutional Program Review: Welcome to the Program Efficacy phase of the San Bernardino Valley College Program Review process. Program Review is a systematic process for evaluating programs and services annually. The major goal of the Program Review Committee is to evaluate the effectiveness of programs and to make informed decisions about budget and other campus priorities.

For regular programmatic assessment on campus, the Program Review Committee examines and evaluates the resource needs and effectiveness of all instructional and service areas. These review processes occur on one-, two-, and four-year cycles as determined by the District, College, and other regulatory agencies. Program review is conducted by authorization of the SBVC Academic Senate.

The purpose of Program Review is to:

- Provide a full examination of how effectively programs and services are meeting departmental, divisional, and institutional goals
- Aid in short-range planning and decision-making
- Improve performance, services, and programs
- Contribute to long-range planning
- Contribute information and recommendations to other college processes, as appropriate
- Serve as the campus' conduit for decision-making by forwarding information to appropriate committees

Our Program Review process includes an annual campus-wide needs assessment each fall and an in-depth efficacy review each spring of each program on a four-year cycle. All programs are now required to update their Educational Master Plan (EMP) narrative each fall. In addition, CTE programs have a mid-cycle update (2 years after full efficacy) in order to comply with Title 5 regulations.

Two or three committee members will be meeting with you to carefully review and discuss your document. You will receive detailed feedback regarding the degree to which your program is perceived to meet institutional goals. The rubric that the team will use to evaluate your program is embedded in the form. As you are writing your program evaluation, feel free to contact the efficacy team assigned to review your document or your division representatives for feedback and input.

Draft forms should be written early so that your review team can work with you at the small-group workshops (March 4 and March 25, 2016). Final documents are due to the Committee co-chair(s) by **Wednesday, March 30** at midnight.

It is the writer's responsibility to be sure the Committee receives the forms on time.

Program Efficacy
2015 – 2016

Program Being Evaluated

Chemistry

Name of Division

Science

Name of Person Preparing this Report **Extension X8268**

John Stanskas

Names of Department Members Consulted

Amy Avelar, Jessy Lemieux, Sheri Lillard, Dave Stevenson, Casey Thomas, Michael Torrez

Colleen Calderon, Maryline Chemama, Evan Craft, Alicia Doyle, Martin Farnum, Shonnia Hayes, Chaminda Hettige, Steve Johnson, Safieh Ladani, George Lessard, Sunggon Lim, Shawn McDonald, Wendy McKeen, Mark Micklich, Gira Raval, Mark Raymundo, Lisa Schmidt, Eman Shweikeh, Jasmeet Singh, James Stephenson, Jon Sutter, Ed Wen, Susan Zhu

Names of Reviewers (names will be sent to you after the committee meets on February 19)

Melinda Moneymaker and Kay Weiss

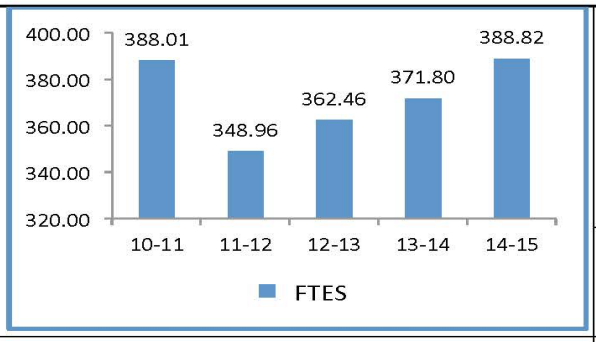
Work Flow	**Date Submitted**
Initial meeting with department	February 26, 2016
Meeting with Program Review Team	
Report submitted to Program Review co-chair(s) & Dean	**by midnight on March 30, 2016**

Staffing

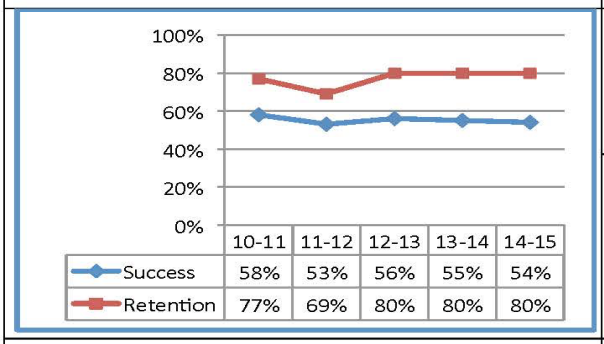
List the number of full and part-time employees in your area.

Classification	Number Full-Time	Number Part-time, Contract	Number adjunct, short-term, hourly
Managers	1		
Faculty	5	26	
Classified Staff	2		
Total	8	26	

Chemistry and Physical Science — 2014-2015



	10-11	11-12	12-13	13-14	14-15
Duplicated Enrollment	1,839	1,611	1,678	1,737	1,801
FTEF	23.06	20.03	22.01	24.81	25.84
WSCH per FTEF	505	523	494	450	451



	10-11	11-12	12-13	13-14	14-15
Sections	84	75	78	91	94
% of online enrollment	4%	3%	4%	7%	3%
Degrees awarded*	5	5	9	8	7
Certificates awarded	N/A	N/A	N/A	N/A	N/A

*These degrees are in chemistry.

Description:

The Chemistry program provides instruction and laboratory experience appropriate for general education requirements in the area of physical sciences, pre-nursing and allied health preparation courses, and lower division preparation required for Chemistry and Biochemistry transfer students. The same lower-division courses service transfer students in nearly every field of science engineering, and pre-professional school preparation, such as pharmacy, dental, and medical schools.

Assessment:

The efficiency of the program has decreased to a lower but still acceptable level for laboratory-based instruction. Some of the factors that have decreased efficiency include the need to generate more FTES by offering single sections at a variety of times. Another factor has been fulfilling the goal of generating more Chemistry and STEM related degrees. Those classes required for majors have lower caps due to safe laboratory practices and therefore decrease efficiency. The department has increased the number of STEM majors prepared for transfer by offering and filling additional sections of general and organic chemistry. The department has also expanded our offerings in non-laboratory based general education classes to increase enrollment and options for students.

Department Goals:

- Continue to increase the number of science, math, and engineering majors to affect the economic viability of our region.
- Continue to increase the number of STEM degrees granted.
- Improve student success.
- Maintain laboratories with equipment and supplies needed for quality education.

Challenges & Opportunities:

- Identifying and retaining adjunct faculty to teach. Every semester we must scramble to identify part-time faculty as our current pool finishes grad. school and/or finds full-time employment. For the last six semesters we have cancelled classes or asked for waivers for faculty to teach above 67%. The unemployment rate for chemists is low.
- The success rate continues to be an issue for the program as we attempt ways to improve student success.

Action Plan:

- We must continue to increase the number of major's preparation sections to increase student access to pathways that lead to STEM degrees.
- Implement and evaluate Supplemental Instruction for major's preparation courses.
- Evaluate effects of prerequisite implementation on student success.
- Maintain our position in the region as the largest community college Chemistry program in the Inland Empire.
- Design an allied health course in general, organic, and biochemistry for CSU transfer nursing students.
- Test online general education courses for efficacy.

Part I: Questions Related to Strategic Initiative: Access

Use the demographic data provided to describe how well you are providing access to your program by answering the questions below.

Strategic Initiative	**Institutional Expectations**	
	Does Not Meet	**Meets**
Part I: Access		
Demographics	The program does not provide an appropriate analysis regarding identified differences in the program's population compared to that of the general population	The program provides an analysis of the demographic data and provides an interpretation in response to any identified variance. If warranted, discuss the plans or activities that are in place to recruit and retain underserved populations.
Pattern of Service	The program's pattern of service is not related to the needs of students.	The program provides evidence that the pattern of service or instruction meets student needs. If warranted, plans or activities are in place to meet a broader range of needs.

INSERT DEMOGRAPHIC DATA (PROGRAM & CAMPUS) Program Review Committee will provide this on or before February 26.

Demographic Measure	Program: Chemistry	Chemistry with Proportional Unknown Split	Campus-wide
Asian	7.90%	9.26%	4.90%
African-American	10.40%	12.19%	13.40%
Hispanic	53.30%	62.47%	61.80%
Native American	0.60%	0.70%	0.30%
Pacific Islander	0.60%	0.70%	0.40%
White	12.60%	14.77%	15.40%
Unknown	14.70%		0.60%
Female	59.80%	59.80%	55.10%
Male	40.20%	40.20%	44.70%

Does the program population reflect the college's population? Is this an issue of concern? If not, why not? If so, what steps are you taking to address the issue?

The program data provided lists a very large 14.70% unknown in the demographic data. To try to compare accurately, a proportional split of that unknown number was used. The table above shows the originally provided data and the adjustment. The Chemistry program's demographic data indicate that it is generally on par with the institution's demographics. White and African American students are slightly underrepresented, but not significantly so. African American student representation in the Chemistry department has increased significantly relative to the 2011 program review in which the percentage of African American students in chemistry classes was 6% lower than the campus average.

Women are overrepresented and men are underrepresented in the chemistry department, relative to the campus average, by about 4.5%. This is a significant change since 2011 when men were overrepresented by about 3%. However, it is worth noting that the program's data does not reflect the differentiation between introductory

chemistry and major's preparation. There are a large number of introductory chemistry courses (Chem101), more than half of the program, that are more diverse in ethnicity/race and more predominately female than the major's preparation classes. Introductory chemistry is required for nursing students, a field that is under-represented by men. Several efforts have been undertaken to build learning communities that target women of color to enter science fields. The major's preparation courses remain slightly less diverse and less female although women are significantly more represented than they were at the time of the 2011 program review, indicating some success in previous efforts to recruit women to major's preparation chemistry courses.

In 2011, SBVC received a STEM (Science, Technology, Engineering and Mathematics) grant that was partially used to build specific, targeted cohorts of women of color to pursue science degrees and transfer, and to increase access to student instructional services through the Student Success Center, including tutoring and Supplemental Instruction (SI) sections. According to the demographic data and other measures of student success, these efforts have been quite fruitful and a renewal of the grant is currently being sought by the director of the STEM program with coordination from science faculty. Also, additional institutional funding for the Student Success Center has recently been approved which should further support these efforts.

The program recognizes that it is over-represented in the Asian demographic. By focusing efforts on targeted cohorts for African-American and Hispanic women, we hope that demographics will shift in the future by adding women of color. We have seen some progress towards this end since the previous program review.

Regarding transfer, the Chemistry Department, and the Science Division as a whole, are working closely with local universities including UC-Riverside to encourage transfer and research opportunities for our students. The UCR-SBVC summer STEM Bridge to Research Program and the UCR CNAS STEM Community College Research Project provide organization and a stipend for minority and low-income students to pursue world-class research opportunities at UCR. The Chemistry program continues to pursue these opportunities to ensure opportunities are available for those underrepresented in our demographics.

Pattern of Service

How does the pattern of service and/or instruction provided by your department serve the needs of the community? Include, as appropriate, hours of operation/pattern of scheduling, alternate delivery methods, weekend instruction/service.

The Chemistry program offers morning, afternoon, and evening classes for the entire sequence of chemistry courses required to graduate with a degree and transfer. Friday and Saturday introductory classes are offered to fulfill general education and pre-nursing requirements. The program offers an online-hybrid Chem104 class each semester for transfer nursing major. In addition, a new one semester General, Organic and Biological Chemistry course designed specifically for the requirements of allied health majors, CHEM105, is currently under development and will debut in Fall 2016.

The Chemistry program has also worked to increase the number of non-laboratory, general education courses it offers. During the economic recession, the program had to protect the transfer pathway as it is required for all STEM majors. For the last two years we have gradually increased the number of general education classes (Chem110, PS101, PS112) without laboratory and have worked to offer those courses in person and online to improve student access.

Part II: Questions Related to Strategic Initiative: Student Success

Strategic Initiative	Institutional Expectations	
	Does Not Meet	**Meets**
Part II: Student Success – Rubric		
Data/analysis demonstrating achievement of instructional or service success	Program does not provide an adequate analysis of the data provided with respect to relevant program data.	Program provides an analysis of the data which indicates progress on departmental goals. If applicable, supplemental data is analyzed.
Student Learning Outcomes (SLOs)	Program has not demonstrated that they are continuously assessing Student Learning Outcomes (SLOs) based on the plans of the program since their last program efficacy. Evidence of data collection, evaluation, and reflection/feedback, and/or connection to student learning is missing or incomplete.	Program has demonstrated that they are continuously assessing Student Learning Outcomes (SLOs) based on the plans of the program since their last program efficacy. Evidence of data collection, evaluation, and reflection/feedback, and connection to student learning is complete.

Provide an analysis of the data and narrative from the program's EMP Summary and discuss what it reveals about your program. (Use data from the Charts 3 & 4 that address Success & Retention and Degrees and Certificates Awarded")

The success rate has remained steady overall the last several years averaging about 55%. The retention rate has increased in the last several years to 80%.

The department uses a comprehensive approach in order to cultivate an environment that encourages and supports both retention and success. The department has continued to advocate for academic support services ranging from tutors to Supplemental Instruction (SI) Leaders. The success and retention data demonstrate that students who attended any tutoring and/ or SI sessions have significantly increased their chances to succeed based on data from the Office of Research, Planning, and Institutional Effectiveness. The obstacles the department faced in offering academic

support include the lack of institutional commitments including funding for tutors and SI Leaders and - very important – the availability of space for SI Sessions and tutoring.

The department's goals of increasing STEM majors and improving success may be reached through providing nurturing environment for students through Learning Communities and Accelerated Courses, most with an SI Leader linked to them. The Learning Communities/ Accelerated Courses that where either in place or attempted are the following:

2013, Fall
- Introductory Chemistry (CHEM101) + Preparation to College Writing (ENGL015)

2014, spring
- Attempted General Chemistry I (CHEM150) + Freshman English (ENGL 101)
- General Chemistry I (CHEM 150), only- with Honors emphasis and field trips

2014, fall
- General Chemistry II (CHEM151) + Organic Chemistry I (CHEM212)

2015, spring
- General Chemistry I (CHEM150) + General Biology I (BIOL 201)

2015, fall
- General Chemistry I (CHEM150) + General Biology I (BIOL 201)
- Introductory Chemistry, Accelerated, then General Chemistry, Accelerated

2016, spring
- General Chemistry I (CHEM150) + General Biology I (BIOL 201)
- General Chemistry I (CHEM150) Accelerated, then General Chemistry II (CHEM151), Accelerated

The obstacles the department faced in offering Learning Communities are institutional commitments including Datatel linking courses correctly for enrollment, advertising, and on-going support for the faculty including time and resources. Despite these obstacles, faculty from each class worked together to align the sequence of curriculum, and linking the concepts in the course. Also, different strategies were used to support and nurture the students. For example, the linked faculty members applied Gallup's *StrengthsFinder* to create more course engagement in students as they utilize their unique skill sets to be successful students. Additionally strengths-based learning, promotes hope in individuals. Others invited counselors to the class to address anxiety and in particular, test anxiety. Several faculty taught note-taking, study and organization skills, and integrated brain-based learning into their teaching. In addition, all students were required to see a STEM counselor once and preferably twice during

the semester. Data does indicate that learning communities and accelerated courses do improve success and retention. The results of these supported learning communities were presented by Susan Bangasser at Hawaii International Conference on Education, 2016; FOSTERING INCREASED PARTICIPATION OF WOMEN AND MINORITIES IN STEM STUDIES.

The departmental goal to continue to grow in offerings of major's preparation courses is ongoing. Over the last year, the program did offer 6 sections of Chemistry 150 and 3 sections of Chemistry 212 per semester. Courses throughout the program have had to be cancelled due to instructor shortage. We have also have had to ask for waivers for instructors to teach above the 67% threshold for the last several years. In the last couple of years over 90 sections per year have been offered by the program. The secondary goal of increasing the number of STEM degrees granted and transfer readiness has also been met as the number of degrees awarded has increased (see SBVC EMP) since the last efficacy report was submitted.

Supplemental Data

Provide any additional information, such as job market indicators, standards in the field or licensure rates that would help the committee to better understand how your program contributes to the success of your students.

The median annual salary of all chemists with at least a baccalaureate degree is $93,000/year from *Chemical & Engineering News*. The article also cites the unemployment rate of chemists is 2.9% in 2014. Both of these trends make it difficult to attract and retain part-time faculty but also make this field attractive to students. http://cen.acs.org/articles/92/i35/2014-Salaries-Employment.html

Presentation: Bangasser, Susan. Hawaii International Conference on Education, 2016; FOSTERING INCREASED PARTICIPATION OF WOMEN AND MINORITIES IN STEM STUDIES.

Student Learning Outcomes

Course SLOs. Demonstrate that your program is continuously assessing Course Student Learning Outcomes (SLOs), based on the plans of the program since the last efficacy review. Include evidence of data collection, evaluation, and reflection/feedback, and describe how the SLOs are being used to improve student learning (e.g., faculty discussions, SLO revisions, assessments, etc.). Generate reports from the SLO Cloud as necessary. Include analysis of SLO Cloud reports and data from 3-year summary reports. This section is required for all programs.

See Strategic Goal 2.11

The department continuously assesses course-level Student Learning Outcomes. Each August and January, prior to the start of the semester, all full-time faculty met with most part-time faculty to discuss departmental issues including SLOs. The part-time faculty engagement averages between 80-90% attendance and subsequent surveys of faculty satisfaction with the 4-5 hour meeting has been very high. These departmental meetings result in in-depth discussions on pedagogy, expectations, and relating ideas and strategies on improvement. The tools themselves are often re-evaluated and changed as necessary. Access to the data is now available on the SLO Cloud which allows for further analysis. The department plans on using disaggregated data for future discussions. For example, the percent of students that met SLO in courses offered Monday- Friday are higher (Chemistry 101: 65.8%) compared to the weekend courses (Chemistry 101: 42.5%). Students also perform significantly better in Distance Education (DE=hybrid courses); specifically Chemistry 104, a course currently required by some BSN programs. Recently, Program Level Outcomes have been assessed and the program is waiting for more information regarding the disaggregated data to be a topic of future departmental meetings.

The Chemistry program continuously assesses all course level SLOs every semester. At the August and January all-faculty meetings (all full time and most part time faculty attend), the program discusses trends in student achievement both through pass rates and through SLO attainment. The notes from January 2015 and August 2015 are below. In January 2015 the program faculty engaged in an exercise to align entry and exit skills

for common topics in every level of chemistry instruction. The faculty then agreed on an appropriate level of exit skills and identified the areas where exit skill expectations may not match SLOs. In August 2015 the program engaged in a dialog regarding ideas that may increase student achievement in small groups and then presented them to the larger group as a whole. These are representative notes where the program has engaged in dialog necessary to evaluate student learning and achievement.

Chemistry Program notes from the August 2015 meeting:

Chemistry Department Meeting Minutes
August 13, 2015 10:30 – 2:30

Present: Avelar, Torrez, Lemieux, Stanskas, Thomas, Stevenson, Johnson, Han, Shweikeh, Raval, Lim, Bartlett, Singh, Lessard, Bula, McDonald, Micklich, Wen, McKeen, Sutter, Jones, Chemama, Hettige

We reviewed laboratory staffing and procedures, enrollment trends and staffing, textbooks, and class caps.
Celia Huston presented information about the SLO Cloud and submission of SLOs procedures.
Accreditation was discussed.
The departmental policies were unanimously adopted for the academic year.
We then broke into three groups with SLO data, success, and retention statistics for the last year.

Group #1: CHEM101
Need to be more explicit about bringing students up to college level science standards
Students seem to have less focus. More direct about putting phones away. AV request for PS228 – more board space needed to accommodate more topic based presentations, small group work.
SI students seem less able to work independently. Need to emphasize learning in groups but practice individually, too. Could all 101 instructors send SI materials to everyone.
More explicit about what students need to “know” and maybe more “pop” quizzes.
Quizzes on lecture and previous week’s labs.
Talk to students about how to decide to drop a class.
Chem101 cloud of resources.

May address SLO#4.

Group #2: CHEM150 & 151
Continue to emphasize that students need to take Chem151 immediately after Chem150.
For Chem151 Crystal Violet Lab - use as opportunity to review shapes, hybridization, and bond angles as preparation for SLO#1. Need to incorporate examples of real-world, biomolecules into examples.
Develop a standardized rubric for grading the SLO quizzes.
For Chem150, dilution is different than chemical reaction! M1V1 = M2V2 only for dilution!
Expose Chem150 students to complex problems to address 151 preparation. Ex: use mixture of two solutions in a precipitation reaction. Find concentration of all ions in solution.
More questions needed for Chem151 SLOs. Break down the SLO questions into smaller parts.
Add Redox and entropy to Chem150!
Push SI and tutoring slips.

Group #3: CHEM212 & 213
Entry level skills needed:
VSEPR, Hybridization, Polarity, IMFs, and basic organic nomenclature (functional group classes and hydrocarbons)
Leaving Chem212 students need to know:
Know precedence rules up to alcohols, stereochemistry, pKa theory, conformations, isomers, IMFs of functional groups, use wedge-dash structure, sketch to name. Nomenclature to reaction.
Need to know all of these for Chem213.
Students need to finish sequence immediately!
IR, Mass Spec, NMR experience needed to help with degree outcomes.
Continuously assessing, evidence of data collection, evaluation, and reflection/feedback, and connection to student learning

Chemistry Program notes from the January 2015 meeting:

Chemistry Department Meeting

January 8, 2015
10AM – 2PM
PS199

Present: Amy Avelar, Maryline Chemama, Alicia Doyle, Sheri Lillard, Shawn McDonald, Mark Micklich, Shushanta Pal, Shohreh Rahbarnia, Gira Raval, John Stanskas, Jim Stevenson, Michael Torrez, Eddie Wen, Derek Yuan, Susan Zhu

The faculty reviewed the policies adopted at the beginning of the academic year and reviewed SLO assessment processes. The faculty also discussed the programmatic outcomes of the chemistry degree and the concern about not being able to track individual students through the sequence. Faculty reviewed the mapping of course level SLOs to Degree Outcomes and decided to continue to utilize the scores from American Chemical Society standardized tests for general and organic chemistry as a measure of student learning at the program level until such a time as the institution can support individual student tracking.

The faculty then identified 8 topics that are essential to the sequence students complete from Introductory Chemistry, Chem101, through General Chemistry 1 and 2, Chem150 and Chem151. In small groups, faculty identified reasonable exit skills expected for each of the three courses. Then, in a large group, the exit skills were compared to the entry skills faculty experience teaching general chemistry. Areas of disconnect are identified in the summary list of the discussion below. The group made a distinction between “familiar with”, “proficient” and “expert” levels of mastery.

1. Significant Figures

101 Exit Skills: Apply s.f. to conversions and throughout stoichiometry
150 Exit Skills: Same plus precision on analog laboratory equipment mastery
151 Exit Skills: Same plus s.f. in logarithmic functions

2. Nomenclature

101 Exit Skills: Inorganic + diatomics – very good understanding. About 70% of polyatomics

Organic - hydrocarbon chains
150 Exit Skills: Inorganic – experts
Organic – hydrocarbons + alcohols + functional group ID
151 Exit Skills: Same

Disconnect between exit skill and entry expectation here

3. Stoichiometry

101 Exit Skills: expert grams → mol and mol → mol in balanced equations
familiar with Avogadro's Number, solutions, limiting reactant
150 Exit Skills: experts at applying to limiting reaction problems, solution stoichiometry, familiar with most difficult topics (e.g., concentration of ion remaining in limiting reactant problem)
151 Exit Skills: apply to titration and equilibrium

4. Balanced Equations

101 Exit Skills: double displacement and neutralization + predict products
experts at balancing equations if given the formula
150 Exit Skills: double displacement, gas evolving, combustion predict products and balance redox, visualize molecular scale and total ionic reactions, majority of solubility rules
151 Exit Skills: Electrochem/Redox, Nuclear Chem

5. Lewis Structures

101 Exit Skills: Dot structures for atoms/ions, molecules with the octet rule. (First three periods)
150 Exit Skills: All molecules, expanded octets, minimizing formal charge, resonance, hybridization and VSEPR
151 Exit Skills: Apply to visualizations of reaction processes in equilibrium and kinetics

Exit skill of 150 does not match entry skill of 151/212 for hybridization and VSEPR

6. Thermochemistry

101 Exit Skills: define endothermic and exothermic as evidence of a reaction
150 Exit Skills: proficiency with calculation of heat, enthalpy using Hess' Law, enthalpy

of phase changes balanced thermochemical equations especially for heat of formation

151 Exit Skills: free energy and entropy calculations

7. Intermolecular Forces

101 Exit Skills: familiar with prediction of H-bonding, dipole-dipole, and dispersio
150 Exit Skills: predict physical properties based on IMFs
151 Exit Skills:

Exit skill of 150 does not match SLO results

8. Solutions

101 Exit Skills: experts at concepts of solutions, familiar with molarity calculation
150 Exit Skills: experts at solution calculation and dilution
151 Exit Skills: same as 150

Students still have difficulty with dilution out of 101 and 151

Program Level Outcomes: If your program offers a degree or certificate, describe how the program level outcomes are being used to improve student learning at the program level (e.g., faculty discussions, SLO revisions, assessments, etc.). Discuss how this set of data is being evaluated or is planned to be evaluated. Generate reports from the SLO Cloud as necessary. Include analysis of SLO Cloud reports and data from 3-year summary reports. If your program does not offer a degree or certificate, this section is optional (but encouraged).

(INSERT COURSE MAP IF AVAILABLE)—Contact Dr. Celia Huston if you need assistance.

See Strategic Goal 2.11

CHEMISTRY A.S. DEGREE: Program SLO to Course SLO Map

Upon attainment of the Chemistry A.S. degree, students are prepared to:

1. Apply the scientific method to evaluate empirical data and form reasonable conclusions.

- Chem150 SLO#1: Students will demonstrate an understanding of the relationships between chemical quantities by using dimensional analysis to convert units of concentration, mass, moles, molecules, atoms or other stoichiometric variables. In addition, students will interpret the results of dimensional analyses to accurately predict the theoretical yields of chemical reactions and compare this to experimentally determined yields.
- Chem212 SLO#1: Given the reaction conditions, the substrate, the nucleophile, and the solvent, students will predict the reaction mechanism, hypothesize the transition state, and justify their prediction of the structural formula of the major product(s) and elucidate the pathway for the electron movement.
- Chem213 SLO#1: Students will analyze spectra from mass spectrometry (MS), infrared spectroscopy (IR), and nuclear magnetic resonance spectroscopy (NMR), to determine the molecular structure of an organic compound and justify the prediction.

2. Develop a worldview that incorporates the role of chemistry in modern society

- Chem150 SLO#2: Based on the conceptual visualization of the atomic realm utilizing the periodic table, theories of bonding, and determinations of molecular structures, students will appraise the physical and chemical properties of substances commonly found in the natural world.
- Chem151 SLO#2: Students will apply principles of equilibrium, electrochemistry, thermodynamics or nuclear chemistry to explain naturally or societally generated phenomena observed in the atmosphere, ocean, or during geological processes.

3. Demonstrate proficiency in standard laboratory techniques commonly acquired in lower division coursework.

- Chem151 SLO#1: Given a lab with multi-step aqueous reactions, students will design a sequence of steps in order to collect the necessary information, analyze

the experimental data using principles of equilibrium, and form conclusions based on data and calculations. Students will evidence the application of the scientific method in their conclusions and analyze their results for sources of possible error.

- Chem213 SLO#4: In the laboratory, students will use chemical tests and spectroscopic data to identify the structures of unknown compounds.

4. Connect chemical concepts and principles to other sciences

- Chem151 SLO#2: Students will apply principles of equilibrium, electrochemistry, thermodynamics or nuclear chemistry to explain naturally or societally generated phenomena observed in the atmosphere, ocean, or during geological processes.
- Chem213 SLO#1: Students will analyze spectra from mass spectrometry (MS), infrared spectroscopy (IR), and nuclear magnetic resonance spectroscopy (NMR), to determine the molecular structure of an organic compound and justify the prediction.

5. Students are ready to transfer to an accredited university as a junior with a major in chemistry or chemistry related major.

- By successful completion of the course sequence required for the degree, students have completed the lower division requirements for the major. In addition, ACS (American Chemical Society) standardized national tests are given for Chem151 and Chem213. These assessment results are used to evaluate students compared to national expectations.

Part III: Questions Related to Strategic Initiative: Institutional Effectiveness

Strategic Initiative	Institutional Expectations	
	Does Not Meet	**Meets**
Part III: Institutional Effectiveness - Rubric		
Mission and Purpose	The program does not have a mission, or it does not clearly link with the institutional mission.	The program has a mission, and it links clearly with the institutional mission.
Productivity	The data does not show an acceptable level of productivity for the program, or the issue of productivity is not adequately addressed.	The data shows the program is productive at an acceptable level.
Relevance, Currency, Articulation	The program does not provide evidence that it is relevant, current, and that courses articulate with CSU/UC, if appropriate. Out of date course(s) that are not launched into Curricunet by Oct. 1 may result in an overall recommendation no higher than Conditional.	The program provides evidence that the curriculum review process is up to date. Courses are relevant and current to the mission of the program. Appropriate courses have been articulated or transfer with UC/CSU, or plans are in place to articulate appropriate courses.

Mission and Purpose:

SBVC Mission: San Bernardino Valley College provides quality education and services that support a diverse community of learners.

What is the mission statement or purpose of the program?

The Chemistry program provides quality instruction and laboratory experience appropriate for general education requirements in the area of physical sciences, pre-nursing and allied health preparation courses, and lower division preparation required for all STEM (Science, Technology, Engineering, and Mathematics) transfer students.

How does this purpose relate to the college mission?

Transfer and career technical education programs are two of the three primary missions of the community college system. The Chemistry department facilitates student preparation in CTE allied health programs by providing foundational knowledge required to understand human biological processes. In addition, nearly all STEM students intending to transfer must complete additional curriculum offered by the department. Chemistry, biochemistry, geology, biology, physics, engineering, mathematics, pre-pharmacy, pre-dental, and pre-medical students all require at least one year of major's preparation chemistry prior to transfer. Lastly, our primary transfer to the UC system is through STEM students who rely on the Chemistry program for appropriate preparation.

Productivity

Provide additional analysis and explanation of the productivity data and narrative in the EMP Summary, if needed. (Use data from charts 1 and 2 (FTEs; Enrollment; FTFE and WSCH per FTFE) on page 3 of this form). Explain any unique aspects of the program that impact productivity data for example; Federal Guidelines, Perkins, number of workstations, licenses, etc.

The enrollment in Chemistry has outpaced that of the college in terms of percentage growth. Even this semester, Spring 2016, when the college is down in enrollment by 4-5%, the Chemistry program is even compared to Spring 2015. The program has expanded major's preparation offerings, and is working to re-introduce non-laboratory general education classes (Chem110, PS101, PS112) that were cut during the economic downturn.

The efficiency of the program has decreased slightly to a lower but still acceptable level for laboratory-based instruction. For laboratory-based classes, where capacity is defined by contract and American Chemical Society (ACS) safety guidelines, there are only 20, 24, or 28 students permitted in laboratory classes depending upon the level of course offered. Some of the downturn is due to demand for more major's preparation classes that have a cap of only 20 or 24. Adding these sections increases transfer students, especially to UC, but decreases the efficiency of the program overall. To increase efficiency, the department schedules some sections where two laboratory sections meet for one lecture class (double sections).

Relevance and Currency, Articulation of Curriculum

If applicable to your area, describe your curriculum by answering the questions that appear after the Content Review Summary from Curricunet.

The Content Review Summary from Curricunet indicates the program's current curriculum status. If curriculum is out of date, explain the circumstances and plans to remedy the discrepancy.

Chem085 has not been offered in several years and may need to be deleted. Crafton Hills College is trying a similar type course this year. The Chemistry Department is waiting to act on this course until it confers with CHC regarding the efficacy of the offering this year. Chem222 and Chem223 are listed as out of date. The program thought they were approved when the independent study template was created. Currently, they have been submitted for curricular review to update them.

Science				
	Chemistry			
	Course	**Status**	**Last Content Review**	**Next Review Date**
	CHEM085 Algebra Review Workshop for Chemistry	Active	05/12/2008	05/12/2014
	CHEM101 Introductory Chemistry	Active	11/19/2012	11/19/2018
	CHEM104 Introduction to Organic Chemistry and Biochemistry	Active	12/03/2012	12/03/2018
	CHEM104H Introduction to Organic Chemistry and Biochemistry - Honors	Active	12/03/2012	12/03/2018
	CHEM110 Environmental and Consumer Chemistry	Active	09/11/2012	09/11/2018
	CHEM150 General Chemistry I	Active	10/21/2013	10/21/2019
	CHEM150H General Chemistry I - Honors	Active	10/21/2013	10/21/2019
	CHEM151 General Chemistry II	Active	10/21/2013	10/21/2019
	CHEM151H General Chemistry II - Honors	Active	10/21/2013	10/21/2019
	CHEM205 Quantitative Chemical Analysis	Active	10/21/2013	10/21/2019
	CHEM212 Organic Chemistry I	Active	11/25/2013	11/25/2019
	CHEM212H Organic Chemistry I - Honors	Active	11/25/2013	11/25/2019
	CHEM213 Organic Chemistry II	Active	10/21/2013	10/21/2019
	CHEM213H Organic Chemistry II - Honors	Active	10/21/2013	10/21/2019
	CHEM222 Independent Study in Chemistry	Active	10/23/2007	10/23/2013
	CHEM223 Independent Study in Organic or Biochemistry	Active	12/10/2007	12/10/2013
	CHEM101 Introductory Chemistry	Historical		
	CHEM101 Introduction to Chemistry	Historical		
	CHEM101 Introductory Chemistry	Historical		
	CHEM104 Introduction to Organic Chemistry and Biochemistry	Historical		
	CHEM104 Introduction to Organic and Biochemistry	Historical		
	CHEM104 Introduction to Organic and Biochemistry	Historical		
	CHEM104 Introduction to Organic and Biochemistry	Historical		
	CHEM104H Introduction to Organic Chemistry and Biochemistry - Honors	Historical		
	CHEM110 Consumer and Environmental Chemistry	Historical		
	CHEM110 Environmental and Consumer Chemistry	Historical		

	CHEM110 Environmental and Consumer Chemistry	Historical		
	CHEM150 General Chemistry I	Historical		
	CHEM150 General Chemistry I	Historical		
	CHEM150H General Chemistry I - Honors	Historical		
	CHEM150H General Chemistry I - Honors	Historical		
	CHEM151 General Chemistry II	Historical		
	CHEM151 General Chemistry II	Historical		
	CHEM151H General Chemistry II - Honors	Historical		
	CHEM151H General Chemistry II - Honors	Historical		
	CHEM205 Quantitative Chemical Analysis	Historical		
	CHEM205 Quantitative Chemical Analysis	Historical		
	CHEM212 Organic Chemistry I	Historical		
	CHEM212 Organic Chemistry I	Historical		
	CHEM212H Organic Chemistry I - Honors	Historical		
	CHEM212H Organic Chemistry I - Honors	Historical		
	CHEM213 Organic Chemistry	Historical		
	CHEM213 Organic Chemistry II	Historical		
	CHEM213H Organic Chemistry II - Honors	Historical		
	CHEM213H Organic Chemistry II - Honors	Historical		

Articulation and Transfer

List Courses above 100 where articulation or transfer is **not** occurring	With CSU	With UC
none		

Describe your plans to make these course(s) qualify for articulation or transfer. Describe any exceptions to courses above 100.

Not applicable

Currency

Follow the link below and review the last college catalog data.
http://www.valleycollege.edu/academic-career-programs/college-catalog.aspx

Is the information given accurate? Which courses are no longer being offered? (Include Course # and Title of the Course). If the information is inaccurate and/or there are listed courses not offered, how does the program plan to remedy the discrepancy?

The catalog continues to list Chem010, which was deleted and doesn't appear in the curriculum report provided.

Part IV: Planning

Strategic Initiative	**Institutional Expectations**	
	Does Not Meet	**Meets**
Part IV: Planning - Rubric		
Trends	The program does not identify major trends, or the plans are not supported by the data and information provided.	The program identifies and describes major trends in the field. Program addresses how trends will affect enrollment and planning. Provide data or research from the field for support.
Accomplishments	The program does not incorporate accomplishments and strengths into planning.	The program incorporates substantial accomplishments and strengths into planning.
Challenges	The program does not incorporate weaknesses and challenges into planning.	The program incorporates weaknesses and challenges into planning.

What are the trends, in the field or discipline, impacting your student enrollment/service utilization? How will these trends impact program planning?

There are several trends in the area of Chemistry and in connected disciplines that are worth noting.

STEM. There continues a movement nationally (identified in our previous efficacy report) to encourage students to pursue education and careers in STEM: Science, Technology, Engineering, and Mathematics (US Department of Education, http://www.ed.gov/stem). As Chemistry is a core discipline, most science and engineering students are required to take CHEM 150/151, and nearly all majors in Chemistry, Biochemistry, and Biology, and most majors in pre-professional paths (e.g., pre-medical, pre-dental, pre-pharmacy, etc.) also require the year of Organic Chemistry (CHEM 212/213). The impact on enrollment in Chemistry courses is addressed on the next page. Locally, the UCR Medical School has opened in response to the national trend of a lack of primary care physicians. This has increased interest locally in pre-medical students.

In response to the general trend in STEM, the Chemistry Department has participated in the efforts of the Science Division and Student Success Center to establish STEM programs and outreach, as a means to attract students into these academic disciplines. Such efforts include the STEM Club, STEM-a-palooza, coordinated supplemental instruction (SI) in Chemistry.

Evidence of the trend toward pursuing STEM transfer goals was found in the programs 2013 survey of Chem101 students. Over a decade ago, approximately 75% of our CHEM 101 students were pursuing an allied health career, such as Nursing. In 2013, the program surveyed Chem101 students and found that number is now 40% pursuing allied health tracks, while 40% are pursuing a STEM pathway and 20% are taking CHEM101 for general education or unknown purposes. For perspective, the number of CHEM101 sections has more than doubled in that time, so the number of students pursuing allied health/CTE tracks is relatively constant. It is the number of STEM students that has dramatically increased.

Statewide Nursing Program Requirements.
A recent decrease in the number of transferrable units allowed for the Nursing degree at the CSU through CSU Executive Order 1100 has led to a dramatic drop in students

enrolling in CHEM 104, as it is no longer a requirement for the transfer institutions. The CSU now only requires one Chemistry course for Nursing. Specifically, in 2010 we offered 4-5 sections of CHEM104 per semester, and now the program routinely offers 2-3 sections of CHEM 104, including the introduction of a hybrid course.

This trend has impacted our program planning in two ways. First, we have reduced the number of CHEM 104 sections offered, based on fill-rates. However, in discussions with our Nursing colleagues, they believe that the content delivered in CHEM 104 (Organic Chemistry and Biochemistry) is important for their students to learn. Therefore, in response to the one-Chemistry course limit imposed by CSU and in the interest of the success of our students upon entering a Nursing program, we have designed a new one-semester course, CHEM 105 (General, Organic, and Biochemistry). This course condenses the information taught in the CHEM 101 – CHEM 104 two-semester sequence into one semester. Creation of this course is one of the items listed on our EMP's Action Plan, and CHEM 105 has been recently approved by the Curriculum Committee. We have scheduled the first offering of CHEM 105 (two sections) for Fall 2016.

Shift in Chemistry Population. The effect of the increase in STEM interest and the change in Nursing degree requirements have had a significant impact on the planning of our Chemistry course offerings. In the past few years, the Chemistry Department has experienced an overall increase in enrollment in Chemistry courses, likely as a result of more students looking to enter STEM disciplines. The 2014–2015 EMP shows a total increase in FTES of 11.42% (388.82 in 2014–2015 compared to 348.96 in 2011–2012). While the absolute number of FTES is about the same as the previous peak in 2010–2011, the influence of the STEM trend is apparent in the specific courses offered. In other words, the influx of STEM students, as compared to those in allied health, directly impacted our planning by causing us to shift the numbers of specific sections being offered:

CHEM 101. 2010–2011: 40 sections; 2015–2016: 50 sections
CHEM 104. 2010–2011: 10 sections; 2015–2016: 5 sections
CHEM 150. 2010–2011: 10 sections; 2015–2016: 15 sections
CHEM 151. 2010–2011: 5 sections; 2015–2016: 9 sections
CHEM 212. 2010–2011: 4 sections; 2015–2016: 7 sections

CHEM 213. 2010–2011: 2 sections; 2015–2016: 4 sections

The impact on our planning was a significant increase in total majors' prep offerings (150/151/212/213) in 2015 – 2016, compared to 2010–2011, with essentially the same FTES. Notably, one of the weaknesses we identified in our previous efficacy report—not being able to offer a sufficient number of CHEM 150 sections to meet demand for STEM fields—has been overcome. The significance of these numbers is that the Chemistry Program is the "largest community college Chemistry program in the Inland Empire," a goal from the program EMP.

Plateau in Enrollment. Although the institution predicted a growth target of 7% for the 2015–2016 academic year, it appears that the Community Colleges may be entering the familiar downward trend of the enrollment cycle, which is anti-correlated with the economy (i.e., as the economy improves, fewer students attend college because employment opportunities are more abundant, and FTES decreases). We have seen changes in Chemistry FTES from 388.82 last year to approximately the same level this year.

The obvious impact on our planning may be a decrease in the number of 150/151/212/213 sections offered in upcoming semesters, and the Program must begin to implement steps now in order to potentially minimize this impact. Ideas may include:

- Establishing regular partnerships with our feeder high schools. While the Chemistry Department participates in the Science day activities coordinated by our Dean, we have not made additional contact directly with the high-school teachers and their students. Beginning these outreach efforts soon to 11th and 12th grade classes, and expanding visits to 10th grade classrooms in the future will be critical for maintaining a critical level of CHEM 101 enrollment.
- Developing internal connections amongst our existing Chemistry courses. We have begun these efforts in faculty meetings, by bringing full-time and adjunct faculty together and discussing amongst ourselves important pedagogy, exit skills, and entry skills for our courses and the overall pathways. The effect is that our adjunct faculty, many of whom teach a single course in a sequence, have a better appreciation for what the students should know leaving a course, and should bring

with them entering the next course. We also hold a Decompression Party at the end of each semester, where the majors' faculty invite their students to a pizza party, for the primary purpose of peer-to-peer interaction. Specifically, we engage the students in a discussion of what is needed for the next class, wherever they are in the sequence. Finally, given the incorporation of SI into many of our courses, the students regularly interact with peers who have already been through the next class(es).

All of these efforts help to inform the students in an earlier class of a sequence about what is needed and what is possible going into the later classes, transferring to the four-year institution, and exploring potential careers. However, an important step in this plan will be to begin to develop a solid foundation of internal outreach for our students during the semester, including targeting those in CHEM 101. One idea may be for faculty to invite a "guest speaker" (e.g., another faculty member who teaches "the next class") to give a short, ~10 min, presentation about content and applications related to subsequent classes, possible future Honors projects, career info, etc. Another possibility could be to arrange and promote informal mixers, much like our Decompression Parties, but in the middle of the semester. Finally, we should start running some surveys for our students, to get a sense about where their interests actually are, how they view their current and future Chemistry classes, and how they see their own strengths and weaknesses.

Availability of Part-Time Faculty

With the advent of the improved economy and statewide focus on the need to hire more full-time faculty, the availability of part-time faculty has decreased and will continue to do so in the future. In Spring 2016, three classes were cancelled due to lack of an instructor. All were staffed but full-time hiring decisions at other institutions drew from our part-time pool. With area colleges currently hiring full-time chemists, the department will continue to be in a position of cancelling classes due to lack of qualified faculty.

Accomplishments and Strengths

Referencing the narratives in the EMP Summary, provide any additional data or new information regarding the accomplishments of the program, if applicable. In what way does your planning address accomplishments and strengths in the program?

Increased Enrollment in Majors' Prep. As discussed in detail under Trends above, the Department has worked very hard to expand our offerings in CHEM 150/151/212/213 to meet demand, and planning efforts include continuing to increase and promote our program to try to maintain these current levels of FTES.

Well-Prepared Transfer Students. A consistent strength of the Chemistry Department for many years now is maintaining a rigorous program of well-prepared transfer students. We receive frequent feedback from other institutions as well as from former students who report that our students are among the best-prepared once they transfer. They have been accepted into prestigious universities such as UC Berkeley, UCLA, and UC Irvine, go on to attend medical school (one of our recent transfer students has just been accepted to UCR for medical school), and receive funded undergraduate research opportunities during summer programs. Maintaining this level of rigor required for our students to succeed is only possible with a dedicated faculty (full-time and part-time) who engage in frequent discussions about pedagogy and student learning.

This accomplishment has been incorporated into our planning for the past couple years by scheduling faculty workshops at the beginning of each semester. These workshops are generally about 3 hours long, and focus on topics such as exit/entry skills for the sequential courses, SLO strengths and weaknesses, common student difficulties with content and suggestions for improvement, teaching techniques, etc. Our adjunct faculty have consistently reported that they find these sessions useful. This semester, we are looking to begin having an additional session in the middle of the semester, in order to engage a discussion about what's working, what isn't, how can full-time faculty help the adjuncts, etc. We are also working on a project to develop an instructor's manual for each lab course, by asking all lab faculty to provide notes and comments on the experiments that they perform.

Streamlined Chemistry Stockroom and Lab Preparation. The sheer volume of laboratory sections offered, in addition to potential safety concerns, finally resulted in the successful hiring of an additional full-time lab technician in Fall 2014, bringing our total to two full-time stockroom staff. The much-needed additional staff has enabled them to evaluate the organization and procedures of the stockroom and bring it to an exceptional level of efficiency. Efforts include:

- Streamlined stockroom inventory. This includes both equipment, such as glassware, and chemicals. Importantly, they have labeled every shelf and drawer, and included these locators on an inventory list available in the stockroom. This effort is directly related to planning, because it enables the stockroom personnel to effectively and efficiently prepare for each day's array of lab experiments for all of the different courses.
- Updated chemical labels. The recent (Globally Harmonized System) GHS standard required relabeling of all of the stockroom's chemicals, which encompassed 400 chemicals and more than 2000 containers.
- Additional student workers. While we have typically had student workers to assist at the stockroom window, cleaning labs, etc., the past couple of years have seen both an increase in number as well as a formalized training of these students. The result is consistent scheduling (there are student workers spanning the week) and planned work activities for these students.

Challenges

Referencing the narratives in the EMP Summary and/or your data, provide any additional data or new information regarding planning for the program. In what way does your planning address trends and weaknesses in the program?

Some of the trends and accomplishments already mentioned are challenges at the same time. For example, the plateau in enrollment and efforts to sustain our recent favorable numbers in majors' prep courses represents a current challenge (as well as being a trend and a success) and planning efforts related to this challenge are described in the section on Trends.

Physical Space. Unfortunately, we have begun to outgrow our space in the "new" Physical Science Building, which has only been open since Summer 2011 (< 5 years). We are feeling this impact in several areas, such as:

- Faculty office space. We occupy all 5 of our full-time offices, and the most recent Needs Assessment ranked Chemistry faculty as 3rd. Whenever we are able to hire an additional faculty, we will be required to take space from our adjunct faculty office (which already houses 26 individual part-time faculty) in order to accommodate a new-hire.
- Tutoring/SI space. One of the concessions that the math and science faculty made, upon designing the current building, was to give up classroom, office, and lab space in order to accommodate the Math and Science Success Center (MSSC), as it was called at that time. Shortly after opening the building, however, an institutional decision was made to move all tutoring into the MSSC, and to rename it the Student Success Center. While there are benefits to centralized tutoring and Supplemental Instruction, we currently face the problem of our Chemistry SI leaders being double and triple booked into classrooms to hold their sessions, often on the opposite side of campus. Frequently, our students are not even able to utilize the study rooms in the Center. The major problem here is that each SI session must be held in its own room, so that the leader can actively engage with his/her students without distractions from the other sessions in the same room.
- Laboratory space. The Chemistry Department occupied 4 laboratory rooms in the old building, and by adjusting square footage of other areas, we were able to squeeze 5 labs into the new building. However, we are quickly approaching the maximum use of these labs. One problem is that often there are rooms that have labs scheduled from 8:00 am to 10:00 pm, with only very short breaks between classes for the stockroom personnel to switch out the experiments.

  While CHEM 101/150/151 could in theory occupy any of 4 rooms, the Organic Chemistry classes (CHEM 104/212/213) really need to be confined to the organic chemistry lab, due to safety issues with those chemicals, specialized equipment, location near the instruments, etc. With our recent expansion of

CHEM 212/213, these courses are also approaching maximum use of the space. In particular, we are at a point where we utilize every lab drawer in the room.

This has greatly impacted our planning, most importantly, in the area of equipment (e.g., glassware) needs for the students. CHEM 212/213 are sophomore-level (and sometimes upper-division) courses at the four-year institutions. When our students transfer, and most of the students in these courses do transfer, they are expected to have acquired a certain standard of laboratory skills. In this particular year-long sequence, it is absolutely necessary that students work independently (i.e., without lab partners), and this can only be accomplished if they have their own set of glassware in their own lab drawer. Our Fall 2015 Needs request for expanding the number of drawers has not been funded, so we have taken steps to purchase the additional glassware and stock temporary totes so that each student has their own set of equipment.

Laboratory Issues. As Chemistry is a lab science, all of our classes (except for the few sections of CHEM 110 and PS 101) have a laboratory component. Several trends potentially impacting our lab courses include:

- Increased lab enrollment in majors' courses (CHEM 150, 151, and especially CHEM 212 and 213).
- Increased need for laboratory supplies (e.g., glassware).
- Elevated costs of chemicals and shipping.
- Additional chemical waste generated, compared to past years.
- New regulatory standards for chemical waste disposal.
- Outdated laboratory equipment.

All of these laboratory challenges represent financial challenges. If we are to continue to provide first-rate laboratory-based education, which is necessary for students to succeed in the competitive disciplines of science majors requiring Chemistry, we will need to see an increase to our budget. As shown above, the cost of doing business is going up. Although the Program consistently looks for ways to save money (e.g., finding alternatives to higher-priced chemicals, changing experiments to generate less

waste, combining orders to save on shipping costs), at some point there just needs to be adequate funding in order to sustain the laboratory component at the requisite level of excellence.

The final item on the list above, outdated laboratory equipment, represents a critical challenge, that many programs face. Nearly all scientific instrumentation has a software component, and although the mechanical part of the instrumentation may still be functional, the software (or computer's operating system) becomes obsolete after 5 or 6 years. Instrument proprietary software is generally expensive, and often relies on a specially trained technician to install the software and ensure that the computer/software/instrument are all communicating properly. We have been fortunate to have been able to purchase or receive by donation modern instrumentation. However, the challenge we face is being able to maintain the instruments and/or software on a routine basis. In recent years, the Science Division has attempted to plan for such upgrades or maintenance by submitting Needs requests for Science Division maintenance funds. We remain hopeful that the institution will take steps to fund these types of requests, so that our students can continue to be competitive as they search for transfer, research, and career opportunities.

Success Rates. As the EMP shows, success rates over the past three years have averaged 55%. This is not acceptable to the Department, and we are constantly brainstorming and implementing ideas to try to improve this rate. Although the success rate used to be higher, it is likely that when CHEM 101 became the perquisite for Biology courses, an unintended consequence was that CHEM 101 became the first science course that these students take. It took a few years to perceive and evaluate this trend. Efforts towards improvement include:

- Training of CHEM 101 SI and facilitated workshop leaders.
- Workshops and communications with adjunct faculty (most of our CHEM 101 offerings are taught by adjunct, due to the increase in majors' prep courses that often must be staffed by full-time instructors).
- Department-wide discussion of CHEM 101 SLOs, necessary skills from the course (e.g., nomenclature, stoichiometry), assessment methods (e.g., multiple-choice exams vs. working out problems), continuity throughout the

course (e.g., introducing a skill early, and continuing to incorporate it into later sections of the course).

- Short-term sequences. For the first time in Fall 2015, we piloted a CHEM 101 (8 weeks)/CHEM 150 (8 weeks) sequence during a single semester.

Difficulty Staffing Courses. Currently, we have 5 full-time faculty and as the EMP shows, in 2014 – 2015 we had load for 13 FTEF (25.84/2 = 12.92 ≈ 13). In other words, only 38% of our Department load is taught by full-time faculty. For the current year, the Chemistry program had faculty load for 13.31 in the fall 2015 and 14.10 in the spring 2016 term, for an average of 13.71. This load is after cancelling three classes for which an instructor could not be identified before the beginning of the term. It also includes 4 part-time faculty teaching more than 67% for the year.

In terms of planning, we submit Needs requests for faculty, and in the Fall we were ranked 3rd. However, we are still faced with having to staff a large number of classes with adjunct faculty. As mentioned in the EMP narrative, it is very difficult to identify and retain this faculty. Because unemployment for chemists is low, individuals who meet our minimum qualifications (MS in Chemistry) have ample opportunity to secure industry jobs. Often, we find local graduate students who are between their MS and PhD degrees, but most of the time, these faculty move on to other positions once they have their doctorate. We know that even if we can hire one more full-time faculty, we will still have a consistent need for approximately 25 – 30 adjunct faculty. Our only solution is to continue to make contact with neighboring four-year institutions, to encourage recent MS graduates to apply for our adjunct pool. But then, to continue with our communication and mentoring efforts (e.g., faculty workshops, informal discussions) to hopefully encourage our part-time faculty to stay at our institution, instead of looking for part-time work elsewhere.

V: Questions Related to Strategic Initiative: Technology, Campus Climate and Partnerships

Strategic Initiative	Institutional Expectations	
	Does Not Meet	**Meets**
Part V: Technology, Partnerships & Campus Climate		
	Program does not demonstrate that it incorporates the strategic initiatives of Technology, Partnerships, or Campus Climate. Program does not have plans to implement the strategic initiatives of Technology, Partnerships, or Campus Climate	Program demonstrates that it incorporates the strategic initiatives of Technology, Partnerships and/or Campus Climate. Program has plans to further implement the strategic initiatives of Technology, Partnerships and/or Campus Climate.

Describe how your program has addressed the strategic initiatives of technology, campus climate and/or partnerships that apply to your program. What plans does your program have to further implement any of these initiatives?

Technology :

Hybrid Online Organic and Biochemistry

The chemistry program offers an online Hybrid Organic and Biochemistry course to cater to allied health majors that can come to campus only one day a week. Customized online videos, Blackboard LMS (learning management system) and specialized Organic sketching/naming Programs have been implemented. We hope to improve the online components (i.e. update videos) in upcoming semesters.

New instruments for chemistry instrument room:

The program has received funding to update our instrument room. The instrument room contains a variety of instruments for general and organic instrumental analysis. It is a

unique aspect of our chemistry program not available to other community colleges. These instruments allow for chemistry students to perform experimental analysis in our General, and Organic Chemistry courses. This valuable experience enriches their introduction to chemistry and provides a laboratory related framework to build upon for STEM students. In our instrument room, we have added a **new GC/MS, updated our FTIR to the industry standard, and are in the process of acquiring a new HNMR.**

-GC/MS

The program has purchased a new dual purpose Gas/ Chromatograph-Mass Spectrometer for use for all major's preparation classes. This instrument is used to deduce chemical components and is a standard industrial instrument. The instrument will also be used in our current honors research program for use with STEM student's research projects. Students are working with state of the art instrumentation in line with current industry standards

-**FTIR**

We have updated to newer Fourier transform infrared spectroscopy (FT-IR) instruments and increased the number of instruments to three. The FT-IR is a defining instrument for Organic chemistry labs and is commonly a requirement (along with fume hoods) for conducting organic labs. The FT-IR is used to identify functional groups in organic molecules and is an essential part of the curriculum for well prepared transfer students. By having multiple FT-IR instruments, we will increase student access by allowing more time with industry standard instrumentation.

-New Laptops and Vernier Lab instruments

The program has updated all computers for use in the chemistry laboratories. We have updated to modern lap tops and implemented Vernier lab measuring instruments for introductory and general Chemistry lab analysis. The Vernier equipment is intuitive and utilizes a touchscreen like most modern instrumentation interfaces.

-HNMR

The program is in the process of acquiring a table-top HNMR that will allow the students to work with real-world instrumentation previously prohibitively expensive to acquire. With this instrument students will be familiar with industry standard equipment and able to translate their education at SBVC to employable experience applicable to most STEM professions.

Campus Climate

-Veterans Club

The department just hired a second full-time laboratory technician who happens to be a Military Veteran who is passionate and knowledgeable about veteran's affairs. He is now the co-chair of the Veteran's Club and has worked to raise funds for the club while generating interest in the Chemistry program and overall improving the campus climate.

-STEM Club

For many years the department has worked with the STEM club to raise funds by facilitating the sales of safety goggles to the chemistry lab students. This allows the STEM club access to our students regularly and draw them into a chemistry degree and increase the presence of the Chemistry Program.

-Chemistry Volunteers

This year the laboratory technicians created several volunteer opportunities for SBVC students who are chemistry students in order to train students in a career field they can pursue with their degree in chemistry as well as update our labeling system to be GHS compliant. Interest in the volunteer position has increased dramatically over the year as word about the value of the position has spread campus wide. This additional opportunity for students to pursue has increased the value of our program to the students.

Chemistry Honors Research Program

The chemistry Honors Program foster future STEM student Transfers by exposing them to student level General and Organic chemistry related research project. Students work with Professors to design and implement a research project. Students then carry out the

project during pre-assigned lab time over a semester. Their results are formulated into a research paper and then presented at our end of semester Honors Poster Presentation. Students have the option of then presenting their work at SBVC college level Honors Symposium. This effective research exposure primes students to a potential STEM career by increasing their likelihood of becoming accepted into a REU (research experience for undergraduates) and/or STEM program.

- REU (research experience for undergraduates) on-going partnerships for students

-The chemistry program has actively informed potential STEM majors of REU (research experience for undergraduates) openings with most students participating in the Chemistry Honors research program applying to REU's.

-New Allied Health Track Course to expedite chemistry course work requirements.

The Chemistry Program has developed and implemented a new specialized allied health chemistry course for allied health track majors. Normally, a chemistry requirement might require allied students to take two courses of chemistry for completion. The new course will help streamline the number of units and time required for their chemistry pre-requisite as well make their time in a chemistry course applicable to their allied health major.

VI: Previous Does Not Meets Categories

Listed below, from your most recent Program Efficacy document, are those areas which previously received "Does Not Meet." Address each area, by describing below how your program has remedied these deficiencies, and, if these areas have been discussed elsewhere in this current document, provide the section where these discussions can be located.

Program Review 2011 team efficacy report does not identify any department deficiencies.